IASH 2015, the 14th INTERNATIONAL SYMPOSIUM ON STABILITY, HANDLING AND USE OF LIQUID FUELS
Charleston, South Carolina USA
4-8 October 2015

TECHNO-ECONOMIC ASSESSMENT OF THE PRODUCTION OF SYNTHETIC JET FUEL BY ELECTROLYSIS AND FISCHER-TROPSCH SYNTHESIS

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ABSTRACT

Future aviation will continue to depend on energy carriers with a high energy density. The "Power-to-Fuel" technology is an approach to produce synthetic jet fuels from renewable energy. A process concept using H_2 produced by water electrolysis and CO_2 to synthesize liquid hydrocarbons was modeled by a flowsheet simulation. The feed capacity was set to 1 GW_{LHV} of H_2 generating 57.5 t/h (13,248 bpd) of liquid hydrocarbons. A baseline Power-to-Fuel efficiency of 47.5 % was calculated, which can be increased to up to 62 %, when a high temperature solid oxide electrolyzer is applied. For systems based on a stationary power input, production cost in the range from 354 \$/bbl (89 \$/MWh_e) to 745 \$/bbl (220 \$/MWh_e) were found. The production cost range from 615 \$/bbl to 1150 \$/bbl when the system is powered by a fluctuating energy source at 185 \$/MWh_e.

KEYWORDS

Renewable energy, Fischer–Tropsch synthesis, Synthetic fuels, Power-to-Liquid